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请 号: PCT/CN2005/002331

ONAL APPLICATION NUMBER

请 日: 28. DEC 2005(28.12.2005)

NAL FILING DATE

称 : A NOVEL USER SENSITIVE INFORMATION ADAPTIVE

CONVENTION

VIDEO TRANSCODING FRAMEWORK

CERTIFIED COPY OF
PRIORITY DOCUMENT

中华人民共和国国家知识产权局局长

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二零零六年四月十七日

APRIL 17, 2006

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only	
PCT/CN 2005 / 0 0 2 3 3 1	
International Application No.	
28 • DEC 2005 (28 • 12 • 2005)	
International Filing Date	
RO/CN 中华人民共和国国家知识产权局 PCT International Application	
Name of receiving Office and "PCT International Application"	
Applicant's or agent's file reference (if desired) (12 characters maximum) I05BJ1127	

Box No. I TITLE OF INVENTION A NOVEL USER SENSITIVE INFORMATION ADAPTIVE VIDEO TRANSCODING FRAMEWORK	
Box No. II APPLICANT <input type="checkbox"/> This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
INTEL CORPORATION 2200 Mission College Boulevard Santa Clara, California 95052 United States of America	
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Applicant's registration No. with the Office	
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LI, Ruijia 318-7-202, Lian Zhong Rd., Shanghai 201204, P. R. China	
This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
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Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
IntellecPro China Limited Suites 902-908, Ping'an Mansion, 23 Jinrong Dajie, Xicheng District, Beijing 100032, P. R. China	
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Teleprinter No.	
Agent's registration No. with the Office 11015	
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

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CHEN, Chun Xi
1488-13-501, Changning Rd., Shanghai 200051, P. R.
China

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

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This person is:

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☐ applicant and inventor
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This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

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This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

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The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.

However,

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(The check-boxes above may be used to exclude (irrevocably) the designations concerned in order to avoid the ceasing of the effect, under the national law, of an earlier national application from which priority is claimed. See the Notes to Box No. V as to the consequences of such national law provisions in these and certain other States.)

Box No. VI PRIORITY CLAIM

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application:* regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				

- ☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office)* identified above as:

- ☐ all items ☐ item (1) ☐ item (2) ☐ item (3) ☐ other, see Supplemental Box

* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)):

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):*

ISA / .CN

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*

Date (day/month/year) Number Country (or regional Office)

Box No. VIII DECLARATIONS

The following declarations are contained in Boxes Nos. VIII (i) to (v) *(mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):*

Number of
declarations

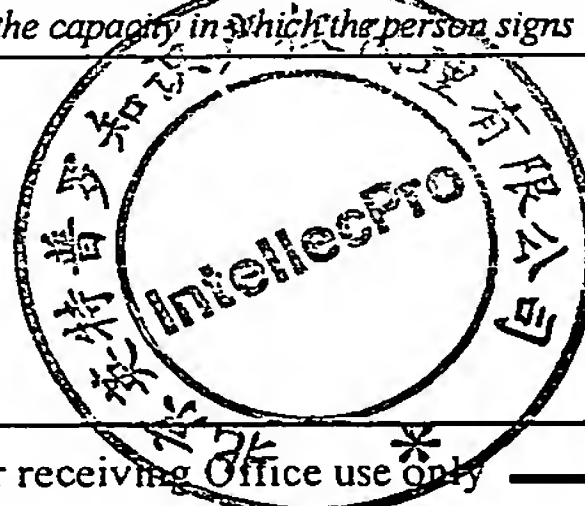
- | | | |
|---|--|---|
| <input type="checkbox"/> Box No. VIII (i) | Declaration as to the identity of the inventor | : |
| <input type="checkbox"/> Box No. VIII (ii) | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent | : |
| <input type="checkbox"/> Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application | : |
| <input type="checkbox"/> Box No. VIII (iv) | Declaration of inventorship (only for the purposes of the designation of the United States of America) | : |
| <input type="checkbox"/> Box No. VIII (v) | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty | : |

Box No. IX CHECK LIST; LANGUAGE OF FILING

This international application contains:	This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):	Number of items
(a) on paper, the following number of sheets:	1. <input checked="" type="checkbox"/> fee calculation sheet	: 1
request (including declaration sheets) :	2. <input type="checkbox"/> original separate power of attorney	:
description (excluding sequence listing and/or tables related thereto) :	3. <input type="checkbox"/> original general power of attorney	:
claims :	4. <input type="checkbox"/> copy of general power of attorney; reference number, if any:	:
abstract :	5. <input type="checkbox"/> statement explaining lack of signature	:
drawings :	6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):	:
Sub-total number of sheets : 20	7. <input type="checkbox"/> translation of international application into (language):	:
sequence listing :	8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material	:
tables related thereto :	9. <input type="checkbox"/> sequence listing in electronic form (indicate type and number of carriers)	:
(for both, actual number of sheets if filed on paper, whether or not also filed in electronic form; see (c) below)	(i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application) :	:
Total number of sheets : 20	(ii) <input type="checkbox"/> (only where check-box (b)(i) or (c)(i) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter :	:
(b) <input type="checkbox"/> only in electronic form (Section 801(a)(i))	(iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listing mentioned in left column :	:
(i) <input type="checkbox"/> sequence listing	10. <input type="checkbox"/> tables in electronic form related to sequence listing (indicate type and number of carriers)	:
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(additional copies to be indicated under items 9(ii) and/or 10(ii), in right column)		
Figure of the drawings which should accompany the abstract:	Language of filing of the international application: English	

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



IntellecPro China Limited

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1. Date of actual receipt of the purported international application: 28 · DEC 2005 (28 · 12 · 2005)	3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	5. International Searching Authority (if two or more are competent): ISA /	
6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid		

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FEE CALCULATION SHEET

Annex to the Request

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PCT/CN 2005 / 0 0 2 3 3 1

International Application No.

28 · DEC 2005 (28 · 12 · 2005)

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I05BJ1127

Applicant

INTEL CORPORATION, et al.

CALCULATION OF PRESCRIBED FEES.

1. TRANSMITTAL FEE CNY 500 [T]

CNY 500.-

2. SEARCH FEE CNY 1500 [S]

CNY 1500.-

International search to be carried out by CN
(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FILING FEE

Where items (b) and/or (c) of Box No. IX apply, enter Sub-total number of sheets } 20
Where items (b) and (c) of Box No. IX do not apply, enter Total number of sheets }

[i1] first 30 sheets CHF 1400 [i1]

[i2] _____ x _____ = _____ [i2]
number of sheets in excess of 30 fee per sheet

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CHF 1400.-

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5. TOTAL FEES PAYABLE CHF 1400 CNY 2000

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A NOVEL USER SENSITIVE INFORMATION ADAPTIVE VIDEO TRANSCODING FRAMEWORK

BACKGROUND

Background

[0001] Transcoding refers to the conversion of one digital file to another. The conversion includes, but is not limited to, format change, resolution change, and bit rate change. In video-on-demand applications, a host computer may respond to a user's request to view a stored video file. The host computer may transcode the stored video file to an appropriate video format and bit rate for transmission through a network to the user. The transcoded format may be compatible with the user's platform, e.g., a television or a personal computer. The host computer may also adjust the transmission bit rate to meet the bandwidth requirement of the network connecting the host and the user.

[0002] Network connection between the host and the user may sometimes be unstable or congested. Video transmission on a wireless connection such as wireless fidelity (WiFi) network is especially susceptible to data loss and errors. Thus, the transcoder on the host usually reduces transmission bit rate to protect against such network conditions. However, a reduced bit rate typically degrades the quality of the video received by the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Embodiments are illustrated by way of example and not by way of limitation in the figures of the accompanying drawings in which like references indicate similar elements. It should be noted that references to "an" or "one" embodiment in this disclosure are not necessarily to the same embodiment, and such references mean at least one.

[0004] FIG. 1 is a block diagram of an embodiment of a video system.

[0005] FIG. 2 is an example of a frame sequence including three frames.

[0006] FIG. 3 is a block diagram of a static model of the video system.

[0007] FIG. 4 is a block diagram of a dynamic model of the video system.

[0008] FIG. 5 is a flowchart showing operations of a transcoder of the video system.

DETAILED DESCRIPTION

[0009] FIG. 1 shows a block diagram of an embodiment of a video system 10. Video system 10 may be a personal computer, a file server, or any computing device having video transcoding capabilities. In one embodiment, video system 10 may be a video-on-demand (VOD) system that transmits a video stream to an end user through a network in response to the user's request. Video system 10 may be coupled to a memory 12 through a memory interface 17 and a memory path 18. Video system 10 may also be coupled to a network 15 through a network interface 19 for transmitting video streams to an end user. Network 15 may be a wire-lined, wireless network, or a combination of both. Network 15 may be a local area network, a wide area network, the Internet, or a combination of all of the above. Memory 12 may be a combination of one or more of volatile or non-volatile memory devices, or any machine-readable medium. For example, a machine-readable medium includes read-only memory (ROM); random-access memory (RAM); magnetic disk storage media; optical storage media; flash memory devices; biological electrical, mechanical systems; electrical, optical, acoustical or other form of propagated signals (e.g., carrier waves, infrared signals, or digital signals).

[0010] Memory 12 may store a plurality of video files, including a media stream file 123, in one or more video formats. Media stream file 123 may include a sequence of frames. Part of each frame may contain information of particular interest or sensitive to a user. For example, FIG. 2 shows three consecutive frames, each of which includes a running person and two moving cars. The user may be more interested in the person than in the cars, and therefore may pay close attention to the details of the person. Thus, the user may designate the person as an object containing user sensitive information. The areas containing the person, as indicated by ellipses 21-23, are referred to as sensitive information parts (SIP) areas. The areas outside of the SIP areas are referred to as non-SIP areas.

[0011] Referring to FIG. 1, in one embodiment, video system 10 may have a transcoding unit 16 comprising transcoder 110, a sensitive information parts (SIP) generator 120, and an optional SIP file analyzer 130, for applying a biased rate control to the video files. In one embodiment, transcoder 110 may assign more bits per macroblock (e.g., a 16-pixel by 16-pixel block) to the SIP area than to the non-SIP area, thereby enhancing the quality of the SIP and the user experience. SIP generator 120 generates the SIP information for each frame. The SIP information may be generated concurrently with the transmission of the transcoded stream, or generated statically into a SIP configuration file 125 stored in memory 12. If the SIP information is generated offline and stored in SIP configuration file 125, the format of the SIP configuration file may not be readily compatible with transcoder 110. SIP file analyzer 130 may be used to convert the file format for transcoder 110 to resolve any format incompatibility.

[0012] In FIG. 1, transcoder 110, SIP generator 120, and SIP file analyzer 130 are shown as hardware devices, which may be implemented by Application-Specific Integrated Circuit (ASIC), Field Programmable Gate Array (FPGA), or any hardware technology suitable for logic device implementation. These hardware devices may have direct access to the files in memory 12 through a direct memory access (DMA) controller 13. Alternatively, one or more of transcoder 110, SIP generator 120, and SIP file analyzer 130 may be implemented as software modules stored in a machine-readable medium, which is previously defined. These software modules may contain instructions executable by a processor 14.

[0013] In a static embodiment, the SIP may be generated under the directions of a user. For example, a user may manually mark one or more SIP areas for each frame and assign each of the marked areas a priority. SIP generator 120 may generate the coordinates of each marked area and save them in SIP configuration file 125. Alternatively, a user may mark the SIP in the frame in which the SIP first appears. SIP generator 120 may use the

marked information to automatically locate the SIPs in the frames that follow. For example, referring to FIG. 2, a user may manually mark ellipses 21-23 to indicate that the running person contains the sensitive information. The user may alternatively mark ellipse 21 only. SIP generator 120 may analyze characteristics of the object (the running person) or the area contained in ellipse 21 and search for objects or areas having the same or similar characteristics in the succeeding frames. SIP generator 120 may utilize standard functions such as those described in the Moving Picture Experts Group-4 (MPEG-4) for the analysis and search. When SIP generator 120 locates an object or an area, the SIP generator may generate a mark, in the shape of an ellipse or any suitable shapes, to encircle it. The coordinates of the marks, whether generated by the user or SIP generator 120, may be stored in SIP configuration file 125. SIP configuration file 125 may store each SIP in the form of an item that includes a frame sequence number, a SIP number, a SIP priority, and the shape and coordinates of the mark encircling the SIP.

[0014] The user may alternatively indicate to SIP generator 120 that an object (e.g., the running person) is the SIP without encircling the object. In this scenario, the user may describe characteristics of the object (e.g., an object of a certain color or a certain height-to-width ratio) to SIP generator 120. The user may alternatively specify an area of fixed coordinates and shape as the SIP area. SIP generator 120 may follow the user's directions to locate the objects or the areas in all of the frames.

[0015] SIP generator 120 may also locate the SIP automatically without the directions from a user or with minimal input from a user. For example, a user may provide a priority for each of the frequently appearing objects. SIP generator 120 may compare the objects in a frame sequence and designate the objects that appear the most frequently and/or have the highest priorities as the SIP. Alternatively, SIP generator 120 may compare the objects in a sequence of frames and designate the objects that appear in the most central location of the frames as the SIP. In another scenario, SIP generator 120 may

compare the intersected areas in a frame sequence and designate the areas that appear the most frequently as the SIP.

[0016] In some embodiments, video system 10 of FIG. 1 may be implemented by a static model or a dynamic model. FIG. 3 and FIG. 4 illustrate embodiments of a static model and a dynamic model of video system 10, respectively. In both of the static and dynamic models, transcoder 110 may transcode media stream file 123 based on the SIP information and the available bandwidth of network 15. Transcoder 110 may determine a different bit rate for the SIP and non-SIP areas to ensure that the quality of SIP is not compromised by the limited bandwidth. The SIP area may be transmitted at a higher bit rate than the non-SIP area. If the available bandwidth is low or if network 15 is unstable, transcoder 110 may reduce the bit rate for transmitting the non-SIP area but maintain the bit rate for transmitting the SIP area. Transcoder 110 may alternatively reduce the bit rates for both the SIP and non-SIP areas but apply a higher bit reduction rate to the non-SIP area. To conserve more bandwidth for the high-priority SIPs, some of the low-priority SIP areas may be discarded. That is, the low-priority SIP areas may be encoded with the same bit rate as the non-SIP areas. Thus, video system 10 may adapt to various network conditions and utilize the bandwidth efficiently to deliver the sensitive information of high quality.

[0017] In the static model of FIG. 3, SIP configuration file 125 is generated prior to the transmission of the transcoded video. SIP configuration file 125 may be imported from a different platform and may have a format not readily interpretable by transcoder 110. SIP file analyzer 130 may read SIP configuration file 125 and convert the file format to another format compatible with transcoder 110. Transcoder 110 may then generate a transcoded stream from media stream file 123 based on the SIP received from SIP file analyzer 130 and the bandwidth status of network 15.

[0018] In the dynamic model of FIG. 4, SIP configuration file 125 and SIP file analyzer 130 may be dispensed with. SIP generator 120 generates the SIP information concurrently with the transcoding operations and directly sends the SIPs to transcoder 110. In one embodiment, transcoder 110 may feed the bandwidth status of network 15 to SIP generator 120, allowing the SIP generator to dynamically adjust the amount of SIP generated based on the network condition.

[0019] FIG. 5 is a flowchart illustrating an example of the operations of a transcoder in some embodiments, e.g., transcoder 110 of FIG. 1. At block 51, transcoder 110 receives a bandwidth status indicating the available bandwidth for transmitting the transcoded video. At block 52, according to the static model of FIG. 3, transcoder 110 receives SIP information from SIP file analyzer 130. Alternatively, according to the dynamic model of FIG. 4, transcoder 110 receives SIP information from SIP generator 120 and forwards the bandwidth status to the SIP generator. Although the SIP information as shown is received after the reception of the bandwidth status, the reception may be in any order and may be concurrent. At block 53, based on the bandwidth status, transcoder 110 determines the bit rates to transcode the SIP and the non-SIP areas. Transcoder 110 may also determine whether to discard the SIP having low priority. At block 54, transcoder 110 forms macroblocks approximating the marked areas or objects. At block 55, transcoder 110 transcodes each of the macroblocks in the SIP areas with a higher bit rate than in the non-SIP areas. At block 56, transcoder transmits the transcoded stream to an end user through network 15.

[0020] In the foregoing specification, specific embodiments have been described. It will, however, be evident that various modifications and changes can be made thereto without departing from the broader spirit and scope of the appended claims. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

CLAIMS

What is claimed is:

1. A method comprising:
defining a first part of a frame as containing sensitive information,
wherein the frame includes the first part and a second part;
transcoding the first part of the frame at a higher bit rate than the
second part of the frame based on bandwidth available for transmitting the
transcoded frame.
2. The method of claim 1 wherein defining a first part of a frame
further comprises:
defining one or more items of the first part of the frame as containing
sensitive information, wherein the item is one of an area and an object.
3. The method of claim 2 further comprising:
storing a coordinate of each of the items in a file.
4. The method of claim 2 wherein defining one or more items of the
first part of the frame further comprises:
transcoding low priority items with the same bit rate as the second part
of the frame if the available bandwidth reduces.
5. The method of claim 1 wherein transcoding further comprises:
reducing the bit rate of the second part of the frame while maintaining
the bit rate of the first part of the frame if the available bandwidth reduces.
6. The method of claim 1 wherein transcoding further comprises:
reducing the bit rate of the second part of the frame more than reducing
the bit rate of the first part of the frame if the available bandwidth reduces.
7. The method of claim 1 wherein defining a first part of a frame
further comprises:

comparing objects in a frame sequence; and
defining the first part as containing the objects appearing most frequently in the frame sequence.

8. The method of claim 1 wherein defining a first part of a frame further comprises:

comparing objects in a frame sequence; and
defining the first part as containing the objects appearing in a most central location of the frame sequence.

9. A system comprising:

a sensitive-information generator to generate a definition of a first part of a frame as containing sensitive information, wherein the frame includes the first part and a second part;

a transcoder to transcode the first part of the frame at a higher bit rate than the second part of the frame based on bandwidth available for transmitting the transcoded frame.

11. The system of claim 9 further comprising:

memory to store a configuration file including a coordinate of an item in the first part of the frame, wherein the item is one of an object and an area.

12. The system of claim 9 further comprising:

memory to store a configuration file including a priority of an item in the first part of the frame, wherein the item is one of an object and an area.

13. The system of claim 12 further comprising:

a file analyzer to convert a format of the configuration file into another format compatible with the transcoder.

14. The system of claim 9 wherein the sensitive-information generator sends the definition of the first frame to the transcoder and receives a status of the bandwidth from the transcoder.

15. A machine-readable medium having instructions therein which when executed cause a machine to:

define a first part of a frame as containing sensitive information, wherein the frame includes the first part and a second part;

transcode the first part of the frame at a higher bit rate than the second part of the frame based on bandwidth available for transmitting the transcoded frame.

16. The machine-readable medium of claim 15 wherein defining a first part of a frame further comprises instructions operable to:

define one or more items of the first part of the frame as containing sensitive information, wherein the item is one of an area and an object.

17. The machine-readable medium of claim 16 wherein defining one or more items of the first part of the frame further comprises instructions operable to:

transcode low priority items with the same bit rate as the second part of the frame if the available bandwidth reduces.

18. The machine-readable medium of claim 15 further comprising instructions operable to:

reduce the bit rate of the second part of the frame while maintaining the bit rate of the first part of the frame if the available bandwidth reduces.

19. The machine-readable medium of claim 15 further comprising instructions operable to:

reducing the bit rate of the second part of the frame more than reducing the bit rate of the first part of the frame if the available bandwidth reduces.

20. The machine-readable medium of claim 15 wherein defining a first part of a frame further comprises instructions operable to:

compare objects in a frame sequence; and

define the first part as containing the objects appearing most frequently in the frame sequence.

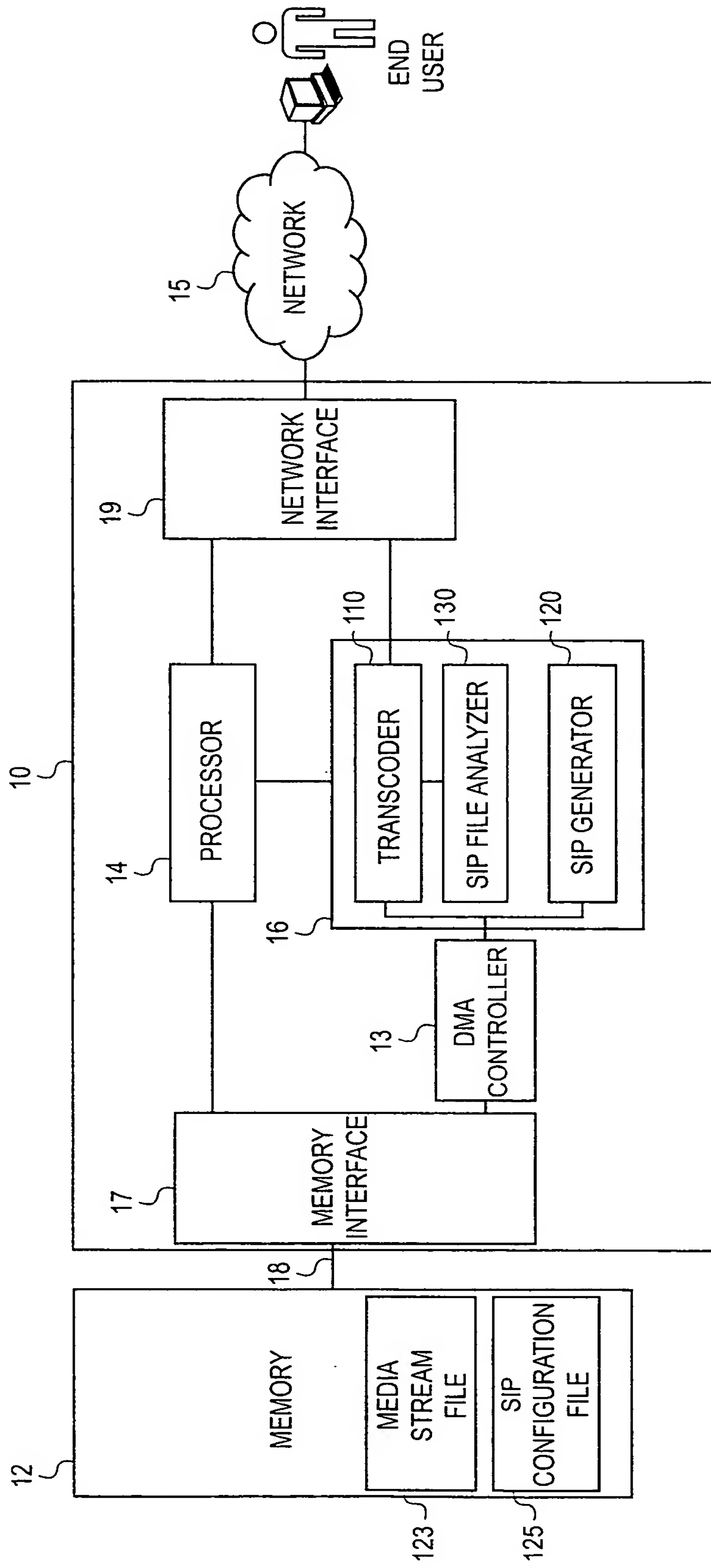
21. The machine-readable medium of claim 15 wherein defining a first part of a frame further comprises instructions operable to:

compare objects in a frame sequence; and

defining the first part as containing the objects appearing in a most central location of the frame sequence.

ABSTRACT

A video system includes a sensitive-information generator to generate a definition of sensitive information parts (SIP) areas. The video system also includes a transcoder to transcode the SIP areas at a higher bit rate than non-SIP areas in the frames based on bandwidth available for transmitting the transcoded frames. The SIP areas are generated statically or dynamically. The video system adapts to various network conditions and utilizes the bandwidth efficiently to deliver the sensitive information of high quality and to enhance the user experience.

**FIG. 1**

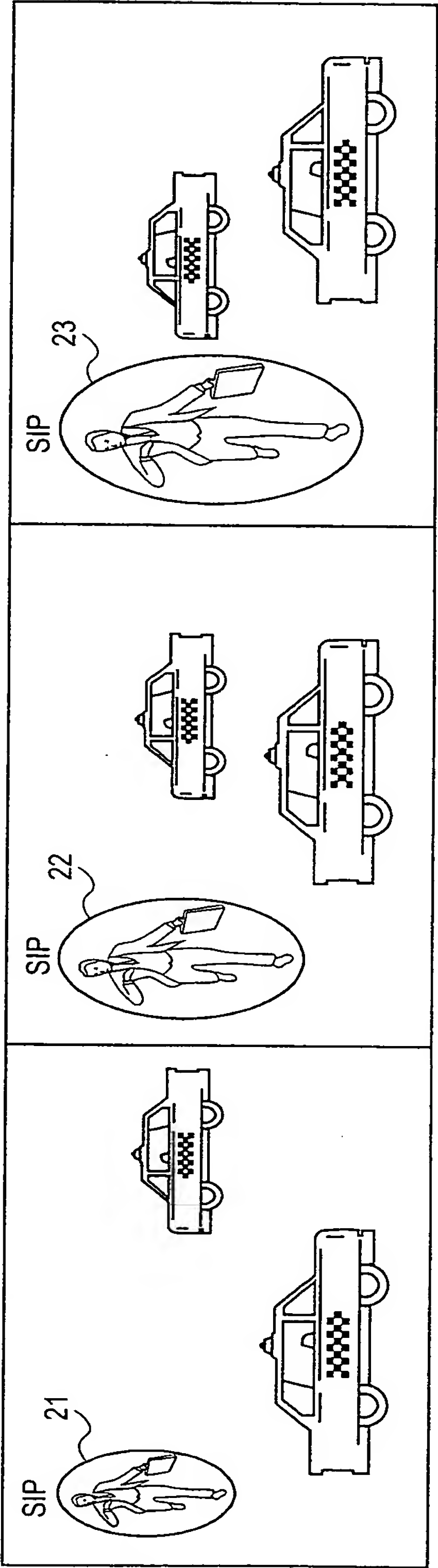


FIG. 2

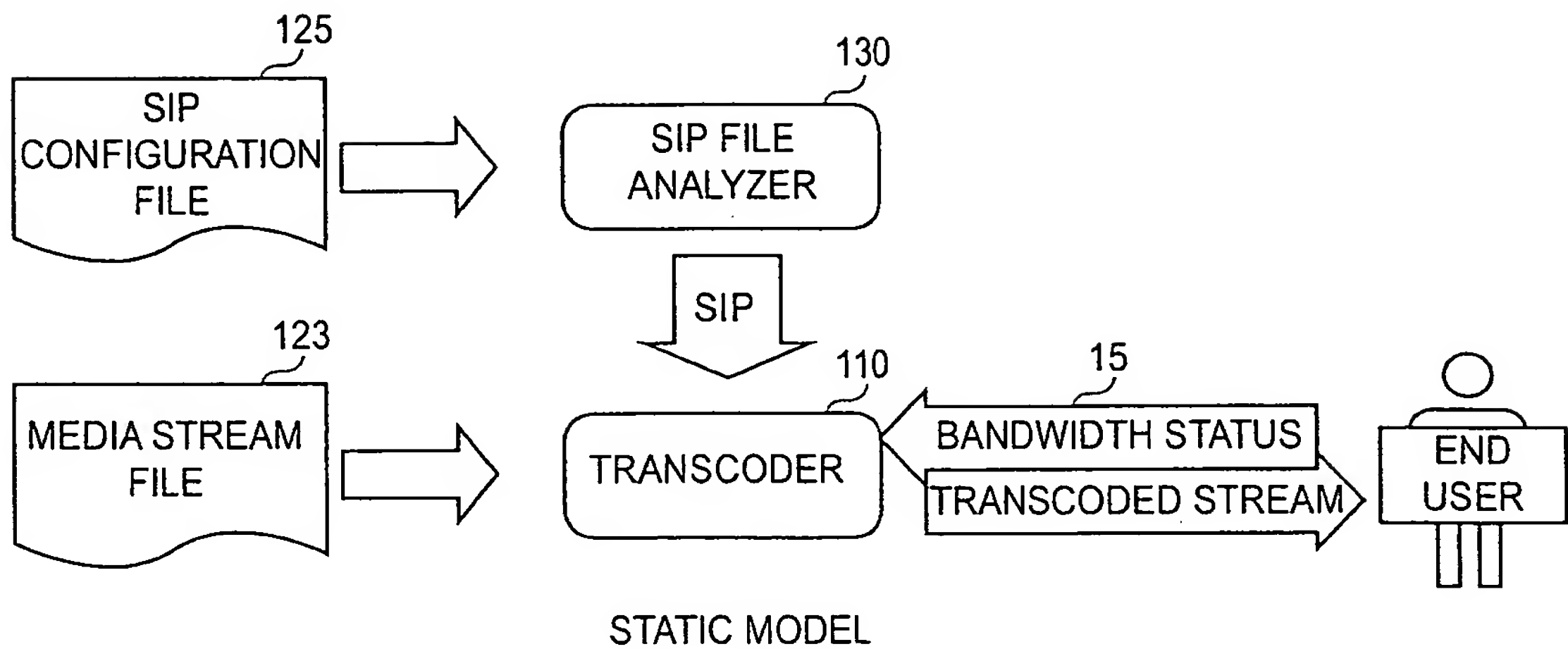


FIG. 3

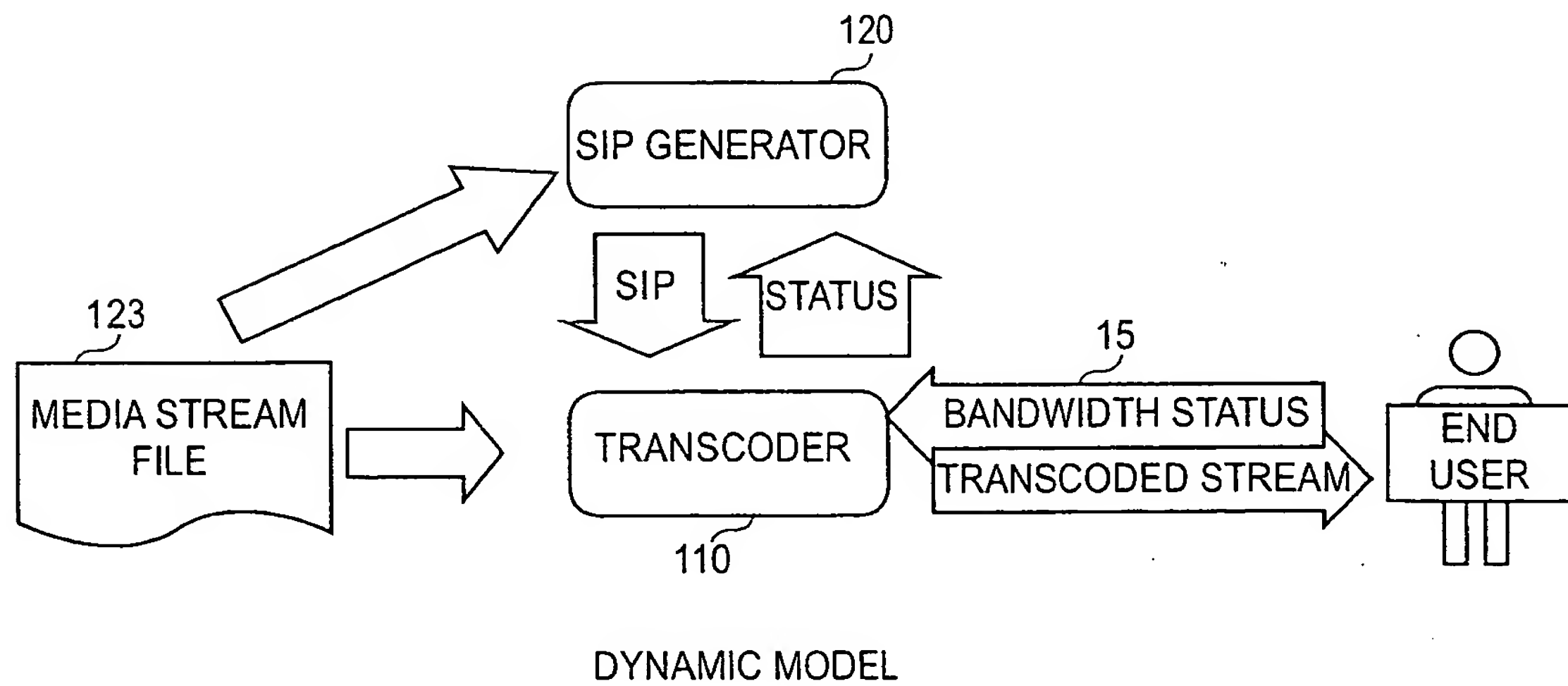


FIG. 4

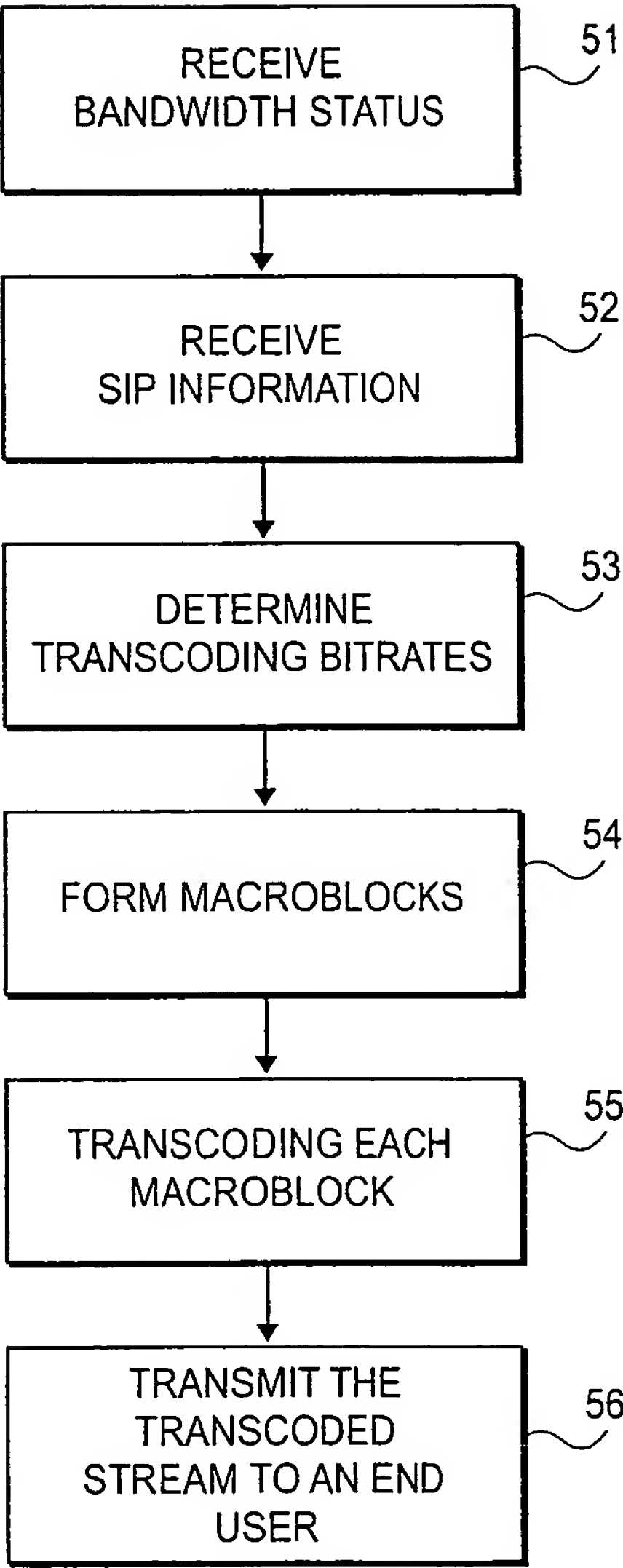


FIG. 5